

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

UNDERGROUND OUTLET, (FEET)

Code 620

DEFINITION

A conduit installed beneath the surface of the ground to collect surface water and convey it to a suitable outlet.

PURPOSE

To dispose of excess water from terraces, diversions, subsurface drains, surface drains, trickle tubes, or principal spillways from dams (outside the dam area only), or other concentrations without causing damage by erosion or flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where (1) excess surface water needs to be disposed of; (2) a buried outlet is needed for Diversion (362), Terrace (600), Water and Sediment Control Basin (638), or similar practices; (3) an underground outlet can be installed that will safely dispose of excess water; and (4) surface outlets are impractical because of stability problems, climatic conditions, land use, equipment traffic, or other factors.

CRITERIA

Capacity. The underground outlet shall be designed, alone or in combination with other practices, with adequate capacity to insure that the terrace, diversion, or other practices function according to the standard for the specific practice. For example, an underground outlet can be used in combination with a grassed waterway or a surface drain to carry part of the design flow. The capacity of the underground outlet for natural or constructed basins shall be adequate for the intended purpose without causing excessive damage to crops, vegetation, or improvements. For crops

or vegetation, the conduit shall have the capacity to remove water in 48 hours or less.

Inlet. An inlet can be a collection box, a perforated riser, or other appropriate device. Inlets shall be installed as necessary. Inlets must be of durable material, structurally sound, and resistant to damage by rodents or other animals. The minimum diameter of inlets shall be 4 inches. Inlets shall be of rigid material, which does not require supplemental support to remain in a vertical position. If burning of vegetation is likely to create a fire hazard, the inlet shall be fire resistant. Collection boxes must be large enough to facilitate maintenance and cleaning operations. The inlet must have an appropriate trash guard to insure that trash or other debris entering the inlet passes through the conduit without plugging. It must also have an animal guard to prevent the entry of rodents or other animals. Perforations in the inlet shall be smooth and without burrs or projections that will collect trash. To compensate for possible plugging of some of the perforations, slots or holes shall be uniformly spaced in the inlet and shall be adequate to provide twice the design flow in the conduit.

Inlet connectors shall be constructed of heavy-duty material, which includes pre-manufactured riser assemblies. The use of drainage tubing tees and elbows shall not be used as the base of an inlet assembly.

Pressure-relief wells shall be designed and installed if needed to control pressure. If junction boxes and other structures are needed, they shall be designed and installed in a manner that facilitates cleaning and other maintenance activities.

Additional subsurface drainage tubing or tile may be used in conjunction with the inlet to improve access and farmability around the inlet. These underground extensions, when used, shall be a minimum of 10 feet in length.

Manufactured endcaps or concrete shall be used to cap the open end(s) to prevent siltation within the drainage tubing or tile.

Hydraulics. Underground outlets shall be continuous conduits, tubing, or tile. Joints shall be hydraulically smooth with the materials and methods used in accordance with that specified by the manufacturer. If a pressure system is used, joints shall be adequate to withstand the design pressure, including surges and vacuum. The maximum velocity must not exceed the safe velocity for the conduit materials and installation. Maximum grades, velocities, and joint protection will comply with Subsurface Drain (606). At least 8 feet of non-perforated conduit shall be installed immediately downstream from any inlet. Positive grade shall be maintained in all sections of an underground outlet. The conduit shall be adequate to carry the design flow when the outlet and all inlets are operating at design capacity. Capacity shall be based on the conduit size as determined by design charts in Engineering Field Handbook Chapter 14, Drainage, or on other flow-control devices (i.e. orifice or offset) to prevent water from the upper inlets from discharging through the lower inlets. The minimum conduit diameter shall be 4 inches. The minimum diameter of offset lines connecting inlets to conduits shall be 3 inches.

Materials shall meet or exceed the design requirements against leakage and shall withstand internal pressure or vacuum and external loading. Plastic, concrete, aluminum, and steel shall meet the requirements specified in the Iowa Construction Specification for Underground Outlets. All materials specified for Subsurface Drains (606) can be used for underground outlets. Conduits, however, can be perforated or non-perforated, depending on the design requirements.

A filter fabric wrap (sock) or equivalent shall be used if migration of soil particles around conduit is anticipated. All exposed plastic materials shall be protected from exposure to sunlight.

Outlet. The outlet shall be sufficiently stable for all anticipated flow conditions. It shall be designed for the maximum anticipated water surface at design flow. A continuous section of closed conduit at least 16 feet long shall be used at the outlet. The closed conduit shall be

durable and strong enough to withstand all anticipated loads, including those caused by ice. If fire is a hazard, the outlet shall be fire resistant. The outlet pipe shall be equipped with a flap-gate type rodent guard rather than a rigid screen or pins.

Excavation and Backfill. Trench excavation shall be grooved in the center for proper conduit bedding. The maximum trench width shall be the conduit diameter plus 24 inches measured at the flow line. The minimum trench width shall be the conduit diameter plus 6 inches, except when the trench is shaped to fit the conduit, additional width is not required. The minimum cover over all types of conduits except metal pipe shall be 24 inches. The minimum cover over metal pipe shall be 12 inches.

Protection. Before the outlet is installed, all disturbed areas shall be re-shaped and re-graded so they blend with the surrounding land features and conditions. Visual resources must be given the same consideration as other design features. Areas that are not to be farmed or covered by structural works shall be established to vegetation or otherwise protected from erosion as soon as practicable after construction.

CONSIDERATIONS

Consideration shall be given to the maintenance of wildlife habitat. The land user will be advised if wetlands will be affected and that current NRCS wetland policy will apply.

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.
2. Effects on the volume of downstream flow that might cause undesirable environmental, social, or economic effects.
3. Potential use of water management.

Water Quality

1. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances that would be carried by runoff.

2. Effects on the visual quality and physical properties of downstream water resources.
3. Sediment-attached and construction-related effects on the quality of downstream water courses.
4. Effects on wetlands or water-related wildlife habitats.
5. Effects on chemical leaching into subsurface water sources.

PLANS AND SPECIFICATIONS

Plans and specifications for installing underground outlets shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

A maintenance program shall be established by the landowner/user to maintain the functional capacity of the underground outlet. Maintenance needs are to be discussed with the landowner/user who is responsible for maintaining the practices installed with NRCS assistance.